REISSUE APPLICATION DECLARATION BY THE ASSIGNEE

Docket Number (optional): EGG-PI-413 RE

I hereby declare that:

The residence, mailing address and citizenship of the inventors are stated below.

I am authorized to act on behalf of the following assignee: Battelle Energy Alliance, LLC

and the title of my position with said assignee is: Secretary

The entire title to the patent identified below is vested in said assignee.

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☐ Additional inventors are named on separately numbered sheets attached hereto.

Patent Number	Date of Patent Issued
RE 37,863	September 24, 2002

Title of Invention: FAST QUENCH REACTOR AND METHOD

I believe said patentee(s) to be the original, first and sole/joint inventor(s) of the subject matter which is described and claimed in said patent, for which a reissue patent is sought on the invention entitled:

FAST QUENCH REACTOR AND METHOD

the specification of which

☐ is attached hereto.

☒ was filed on July 31, 2003 as reissue application number 10/633,464

and was amended concurrently herewith

(if applicable)

I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I verify believe the original patent to be wholly or partly inoperative or invalid, for the reasons described below. (Check all boxes that apply.)

☒ by reason of a defective specification or drawing.

☐ by reason of the patentee claiming more or less than he had the right to claim in the patent.

☒ by reason of other errors.

REISSUE APPLICATION DECLARATION BY THE ASSIGNEE

Docket Number (Optional)
EGG-PI-413 RE

At least one error upon which reissue is based is described as follows:

Errors in specification and numerous errors in claims, including antecedent-basis issues. Specific examples of errors are set forth on the attached additional sheets.

[Attach additional sheets, if needed.]

All errors corrected in this reissue application up to the time of execution of this declaration, and which is not covered by a prior oath or declaration, arose without any deceptive intention on the part of the applicant.

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine and imprisonment, or both, under 18 U.S.C. 1001, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this declaration is directed.

Full name of person signing (given name, family name)
Mark D. Olsen

Signature Mark D. Olsen Date 1 May 2006

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Statement of Errors:

Specific errors being corrected in the present reissue application include:

The correction of the example of extremely fine powder product set forth in column 12, lines 53-59 (i.e., the size has been corrected from "-20 nm" to -- e.g., 20 nm --, to correct the recitation of a negative value).

Claim 5 previously included the limitations that "the minimum temperature within the reactor is between about 1700°C and about 4000°C.. The recitation of a temperature inside a portion of the claimed apparatus may be interpreted as failing to further limit the claim from which claim 5 depends as is required by 37 CFR 1.75(c). Furthermore, such limitations may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 5 might be interpreted as reciting process limitations while the statutory class of the claims is that of a machine or apparatus. Claim 5 has been amended in the current reissue application to read as follows:

> 5. The fast quench reactor of claim [2] *1*, wherein the [[minimum]] the high temperature heating means is configured to heat the reactant stream [[temperature]] within the reactor chamber [[is]] to a temperature between about 1700° C. and about 4000° C.

The amendment to claim 5 provides for proper interpretation of the claim as an apparatus claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 6 previously included the limitations the "maximum temperature of the gaseous stream exiting the nozzle is less than about 500°C. The recitation of the temperature of the gaseous stream passing through the claimed apparatus may be interpreted as failing to further limit the claim from which claim 6 depends as is required by 37 CFR 1.75(c). Furthermore, such limitations may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 6 might be interpreted as reciting process limitations while the statutory class of the claims is that of a machine or apparatus. Claim 6 has been amended in the current reissue application to read as follows:

> 6. The fast quench reactor of claim [2] *1*, wherein the convergent-divergent nozzle is configured to cool [[maximum temperature of]] the gaseous stream exiting the nozzle [[is less than]] to about 500° C or less.

The amendment to claim 6 provides for proper interpretation of the claim as an apparatus claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 11 has been amended to correct antecedent basis issues (i.e., "the width of a reactor chamber " being amended to --a width of the reactor chamber--). The amendment of claim 11 corrects the antecedent basis for the term "width" and ensures compliance with 35 U.S.C. § 112.

Claim 12 has been amended to correct antecedent basis issues (i.e., "the diameter of the reactor chamber" being amended to --a diameter of the reactor chamber--, and "plasma torch exit width" being amended to --a width of the plasma torch exit--). The amendment of claim 12 corrects the antecedent basis for the terms "diameter" and "width" and ensures compliance with 35 U.S.C. § 112.

Claim 13 previously included the limitation that "the converging section of the nozzle has a high aspect ratio." The recitation of a section of a nozzle having a "high aspect ratio" without further limitation may be considered to be vague or indefinite. As such claim 13 has been amended to read:

> 13. The fast quench reactor of claim [2] *1*, wherein [the nozzle has a converging section and a diverging section respectively leading to and from a restrictive open throat,] the converging section of the nozzle [having] [[has]] is configured to provide a high aspect ratio transition with respect to a cross-sectional area of an opening of the outlet end of the reaction chamber and a cross-sectional area of the nozzle throat.

The inclusion of the structural limitations in claim 13 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112.

Claim 14 previously included the limitation that "the converging section of the nozzle has a high aspect ratio..." The recitation of a section of a nozzle having a "high aspect ratio" without further limitation may be considered to be vague or indefinite. Claim 14 further included various recitations that might be interpreted as presenting antecedent basis issues (i.e., with regard to the recitation of a "nozzle throat," the radii of convex and concave surfaces and a "diameter" of the nozzle throat). Claim 14 has been amended to read as follows:

> 14. (Currently Amended) The fast quench reactor of claim [2] *1*, wherein [the nozzle has a converging section and a diverging section respectively leading to and from a restrictive open throat,] the converging section of the nozzle [having] [[has]] provides a high aspect ratio transition with respect to a cross-sectional area of an opening of the outlet end of the reaction chamber and a cross-sectional area of the nozzle throat including [[presented by]] successive [[convex and]] concave and convex surfaces leading into [a] *the* nozzle throat having a circular cross section, [[the]] a radius of the convex surfaces and a radius of the concave [[surfaces]] surface each being approximately equal to [[the]] a diameter of the nozzle throat.

The inclusion of the structural limitations in claim 14 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112. Additionally the correction of antecedent basis issues further ensures compliance with 35 U.S.C. § 112. The amendment of claim 14 also corrects the recitation of "successive convex and concave surfaces" to –successive concave and convex surfaces– which is consistent with what is shown and described in the specification so as to ensure compliance with 35 U.S.C. § 112, paragraph 1.

Claim 19 previously include the limitation of a "converging section of the nozzle having a high aspect ratio for accelerating the gaseous stream rapidly into the nozzle throat while maintaining a laminar flow." The recitation of a section of a nozzle having a "high aspect ratio" without further limitation may be considered to be vague or indefinite. Claim 19 has been amended in the current reissue application to read, in part:

> the converging section of the nozzle [[having]] configured to provide a high aspect ratio transition with respect to a cross-sectional area of an opening at the outlet end of the reactor chamber and a cross-sectional area of the nozzle throat to accelerate [[for accelerating]] the gaseous stream rapidly into the nozzle throat while maintaining laminar flow;

The inclusion of the structural limitations in claim 19 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112.

Claim 21 included the recitation of "the reactor chamber axis" which element had not been previously recited by itself or its base claim. Claim 21 has been amended to now recite ~the reactor axis~ in order to remove any perceived ambiguities and to ensure compliance with 35 U.S.C. § 112.

Claim 22 has also been amended to correct issues related to antecedent basis (i.e., of a "diameter of the reactor chamber" and a "diameter of the plasma torch exit"). These amendments ensure compliance with 35 U.S.C. § 112.

Claim 24 corrects various antecedent basis issues (i.e., the "nozzle throat", the radii of various surfaces and a "diameter" of the nozzle throat). Additionally, the amendment of claim 24 corrects the recitation of "successive convex and concave surfaces" to ~successive concave and convex surfaces~ which is consistent with that which is shown and described in the specification. Such amendments help to ensure the compliance of claim 24 with 35 U.S.C. § 112, including paragraphs 1 and 2.

Claim 34, which is directed to a method of thermally converting one or more reactants, previously included language specifically directed to apparatus limitations, namely:

> wherein the converging-diverging nozzle has a converging section having a high aspect ratio and presented by successive convex and concave surfaces leading into a nozzle throat having a circular cross section, the radius of the convex and concave surfaces being approximately equal to the diameter of the nozzle throat.

Such limitations may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 34 might be interpreted as improperly intermixing system/apparatus limitations in a claim belonging to the statutory class of a method or process. Moreover, such apparatus limitations may not be considered as further limiting claim 31 from which claim 34 depends as is required by 37 CFR 1.75(c). Claim 34 has been amended in the present reissue application to now recite:

> 34. The method of claim 31, further comprising configuring the [[wherein the]] [step of rapidly cooling the desired end product is accomplished by use of] [[converging-diverging]] convergent-divergent nozzle [[has]] to include a converging section [of the nozzle] [[having]] which provides a high aspect ratio transition with respect to a cross-sectional area of an opening of the outlet end of the reaction chamber and a cross-sectional area of a nozzle throat including [[and presented by]] successive [[convex and]] concave and convex surfaces leading into [[a]] the nozzle throat [[having a circular cross section]], [[the]] a radius of the convex surface and a radius of the concave [[surfaces]] surface being approximately equal to [[the]] a diameter of the nozzle throat.

The inclusion of affirmative method acts in claim 34 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c). Moreover, the amendment of claim 34 further corrects antecedent basis issues and corrects the recitation of "successive convex and concave surfaces" to ~successive concave and convex surfaces~ which is consistent with what is shown and described in the specification to further ensure compliance with 35 U.S.C. § 112.

Claim 35 previously recited: "wherein the converging-diverging nozzle has a converging section and a diverging section..." Such limitations may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 35 might be interpreted as improperly intermixing system/apparatus limitations in a claim belonging to the statutory class of a method or process. Additionally, claim 35 might be interpreted as failing to further limit the claim(s) from which claim 35 depends as is required by 37 CFR 1.75(c). Claim 35 has been amended in the present reissue application to now recite:

> 35. The method of claim 31, further comprising configuring the [[wherein the]] [step of rapidly cooling the desired end product is accomplished by use of a] [[*converging-diverging*]] convergent-divergent nozzle [having] [[*has*]] to include a converging section and a diverging section respectively leading to and from a restrictive open throat, and configuring the diverging section of the nozzle [[having]] to exhibit a substantially conical configuration.

The inclusion of affirmative method acts in claim 35 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 36 previously recited: "wherein the converging-diverging nozzle has a converging section and a diverging section respectively leading to and from a restrictive open throat, the diverging section of the nozzle having a conical configuration..." Such limitations may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 36 might be interpreted as improperly intermixing system/apparatus limitations in claim belonging to the statutory class of a method or process. Additionally, claim 36 might be interpreted as failing to further limit the claim(s) from which claim 36 depends as is required by 37 CFR 1.75(c). Claim 36 has been amended in the present reissue application to now recite:

> 36. The method of claim 35 [[31]], further comprising [[wherein the]] [step of rapidly cooling the desired end product is accomplished by use of a] [[*converging-diverging nozzle [having] has* a converging section and a diverging section respectively leading to and from a restrictive open throat,]] configuring the diverging section of the nozzle [[having]] to exhibit a substantially conical configuration with an included angle of less than about 35°.

The inclusion of affirmative method acts in claim 36 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 38 previously included the limitations that "the desired end product is titanium metal and the at least one reactant comprises titanium tetrachloride and hydrogen." The mere recitation of an identified "end product" and a "reactant" might be interpreted as failing to further limit the claim(s) from which claim 38 depends as is required by 37 CFR 1.75(c). Furthermore, such limitations may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 38 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim 38 has been amended in the present reissue application to recite:

> 38. The method of claim 31, wherein retaining the desired end product within the flowing gaseous stream includes retaining [[is]] titanium metal and wherein introducing the reactant stream includes introducing [[the]] [reactants are] [[*at least one reactant comprises*]] titanium tetrachloride and hydrogen.

The inclusion of affirmative method acts in claim 38 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 39 previously included the limitations that "the desired end product is vanadium metal and the at least one reactant comprises vanadium tetrachloride and hydrogen." The mere recitation of an identified "end product" and a "reactant" might be interpreted as failing to further limit the claim(s) from which claim 39 depends as is required by 37 CFR 1.75(c). Furthermore, such limitations may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 39 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim 39 has been amended in the present reissue application to recite:

> 39. The method of claim 31, wherein retaining the desired end product within the flowing gaseous stream includes retaining [[is]] vanadium metal and wherein introducing the reactant stream includes introducing [[the]] [reactants are] [[*at least one reactant comprises*]] vanadium tetrachloride and hydrogen.

The inclusion of affirmative method acts in claim 39 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 40 previously included the limitations that "the desired end product is aluminum metal and the at least one reactant comprises ... aluminum chloride and hydrogen." The mere recitation of an identified "end product" and a "reactant" might be interpreted as failing to further limit the claim(s) from which claim 40 depends as is required by 37 CFR 1.75(c). Furthermore, such limitations may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 40 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim 40 has been amended in the present reissue application to recite:

> 40. The method of claim 31, wherein retaining the desired end product within the flowing gaseous stream includes retaining [[is]] aluminum metal and wherein introducing the reactant stream includes introducing [[the]] [reactants] [[*at least one reactant comprises are*]] aluminum chloride and hydrogen.

The inclusion of affirmative method acts in claim 40 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 41 previously included the limitations that "the desired end product is a titanium-vanadium alloy and the at least one reactant comprises a mixture of titanium tetrachloride, vanadium tetrachloride, and hydrogen, or a mixture of titanium tetrachloride, vanadium trichloride and hydrogen." The mere recitation of an identified "end product" and a "reactant" might be interpreted as failing to further limit the claim(s) from which claim 41 depends as is required by 37 CFR 1.75(c). Furthermore, such limitations may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 41 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim 41 has been amended in the present reissue application to recite:

> 41. The method of claim 31, wherein retaining the desired end product within the flowing gaseous stream includes retaining [[is]] a titanium-vanadium alloy and wherein introducing the reactant

stream includes introducing [[the]] [reactants are] [[*at least one reactant comprises*]] *a mixture of* titanium tetrachloride, [and] vanadium tetrachloride, [plus] *and* hydrogen, *or a mixture of titanium tetrachloride, vanadium trichloride and hydrogen.*

The inclusion of affirmative method acts in claim 41 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 42 previously included the limitations that "the desired end product is a titanium-boron composite ceramic powder and the at least one reactant comprises titanium tetrachloride and boron trichloride." The mere recitation of an identified "end product" and a "reactant" might be interpreted as failing to further limit the claim(s) from which claim 42 depends as is required by 37 CFR 1.75(c). Furthermore, such limitations may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 42 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim 42 has been amended in the present reissue application to recite:

42. (Currently Amended) The method of claim 31, wherein retaining the desired end product within the flowing gaseous stream includes retaining [[is]] a titanium-boron composite ceramic powder and wherein introducing the reactant stream includes introducing [[the]] [reactants are] [[*at least one reactant comprises*]] titanium tetrachloride and boron trichloride.

The inclusion of affirmative method acts in claim 42 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 43 previously included the limitations that "the desired end product is titanium dioxide and the at least one reactant comprises titanium tetrachloride and oxygen." The mere recitation of an identified "end product" and a "reactant" might be interpreted as failing to further limit the claim(s) from which claim 43 depends as is required by 37 CFR 1.75(c). Furthermore, such limitations may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 43 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim 43 has been amended in the present reissue application to recite:

43. The method of claim 31, wherein retaining the desired end product within the flowing gaseous stream includes retaining [[is]] titanium dioxide and wherein introducing the reactant stream includes introducing [[the]] [reactants are] [[*at least one reactant comprises*]] titanium tetrachloride and oxygen.

The inclusion of affirmative method acts in claim 43 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 44 previously included the limitations that "the desired end product is acetylene and the at least on reactant comprises methane and hydrogen." The mere recitation of an identified "end product" and a "reactant" might be interpreted as failing to further limit the claim(s) from which claim 44 depends as is required by 37 CFR 1.75(c). Furthermore, such limitations may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 44 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim 44 has been amended in the present reissue application to recite:

> 44. The method of claim 31, wherein retaining the desired end product within the flowing gaseous stream includes retaining [[is]] acetylene and wherein introducing the reactant stream includes introducing [[the]] [reactants are] [[*at least one reactant comprises*]] methane and hydrogen.

The inclusion of affirmative method acts in claim 44 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 46 previously recited: "wherein the converging section of the nozzle has a high aspect ratio and is configured so that the gaseous stream accelerates rapidly into the nozzle throat while maintaining laminar flow." The recitation of a converging section of a nozzle having a "high aspect ratio" without further limitation may be considered to be vague or indefinite. Moreover, such limitations may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 46 might be interpreted as improperly intermixing system/apparatus limitations in claim belonging to the statutory class of a method or process. Additionally, claim 46 might be interpreted as failing to further limit the claim(s) from which claim 46 depends as is required by 37 CFR 1.75(c). Claim 46 has been amended in the present reissue application to now recite:

> 46. The method of claim 45, further comprising continuing [further comprising the following step: accelerating] [[*wherein*]] *the converging section of the nozzle* [[*has*]] to provide *a high aspect ratio* transition with respect to a cross-sectional area of an opening of the outlet end of the reaction chamber and a cross-sectional area of a nozzle throat [[*and is configured so that*]] and to accelerate the gaseous stream [[*accelerates*]] rapidly into the nozzle throat while maintaining laminar flow *[by passage of the gaseous stream through a converging section of the nozzle having a high aspect ratio]*.

The inclusion of affirmative method acts in claim 46 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 48 previously recited: "wherein the converging-diverging nozzle is adapted to accelerate the gaseous stream to sonic velocities during passage through the throat of the nozzle to transform thermal energy of the moving gaseous stream into kinetic energy in the axial direction of gas flow..." The recitation of a converging section of a nozzle having a "high aspect ratio" without further limitation may be considered to be vague or indefinite. Moreover, such limitations may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 48 might be interpreted as improperly intermixing system/apparatus limitations in claim belonging to the statutory class of a method or process. Additionally, claim 46 might be interpreted as failing to further limit the claim(s) from which claim 48 depends as is required by 37 CFR 1.75(c). Claim 48 has been amended in the present reissue application to now recite:

> 48. The method of claim 45, further comprising [further comprising the following step: accelerating] [[*wherein the converging-diverging*]] configuring the convergent-divergent *nozzle*[[*is adapted*]] *to accelerate* the gaseous stream to sonic velocities during passage through the throat of the nozzle to transform thermal energy of the moving gaseous stream into kinetic energy in the axial direction of gas flow, thereby retaining the desired end product within it.

The inclusion of affirmative method acts in claim 48 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 53 previously included the limitations that "the one or more reactants comprises oxygen in an amount sufficient to produce titanium dioxide as the desired end product." The mere recitation of an identified "reactant" might be interpreted as failing to further limit the claim(s) from which claim 53 depends as is required by 37 CFR 1.75(c). Furthermore, such limitations may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 53 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim 53 has been amended in the present reissue application to recite:

> 53. The method of claim 50, further comprising providing oxygen as a reactant of [further comprising the step of introducing sufficient] [[wherein]] the one or more reactants [[comprises oxygen]] [to the hot plasma] in an amount sufficient to produce titanium dioxide as the desired end product.

The inclusion of affirmative method acts in claim 53 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 54 previously included the limitation that "the temperature of the hot plasma is in excess of approximately 4000 K." The recitation of temperature of the plasma might be interpreted as failing to further limit the method claim(s) from which claim 54 depends as is required by 37 CFR 1.75(c). Furthermore, such a limitation may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 54 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim 54 has been amended in the present reissue application to recite:

> 54. The method of claim 50, further comprising heating the hot plasma to a [[wherein the]] temperature [[of the hot plasma is]] in excess of approximately 4000 K.

The inclusion of affirmative method acts in claim 54 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 55 previously included the limitation that "the one or more reactants comprises hydrogen." The mere recitation of an identified "reactant" might be interpreted as failing to further limit the claim(s) from which claim 55 depends as is required by 37 CFR 1.75(c). Furthermore, such a limitation may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 55 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim 55 has been amended in the present reissue application to recite:

> 55. (Currently Amended) The method of claim 50, further comprising providing hydrogen as at least one reactant of [[wherein]] the one or more reactants [includes] [[comprises hydrogen]].

The inclusion of affirmative method acts in claim 55 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 59 previously included the limitation that "the gaseous or volatilized compound of the selected metal is a gaseous or volatilizable halide." The mere recitation of an identified compound might be interpreted as failing to further limit the claim(s) from which claim 59 depends as is required by 37 CFR 1.75(c).

Furthermore, such a limitation may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 59 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim 59 has been amended in the present reissue application to recite:

> 59. *The method of claim 58, wherein* providing a reagent or a reagent mixture further includes providing [[*the gaseous or volatilized compound of the selected metal is*]] *a gaseous or volatilizable halide.*

The inclusion of affirmative method acts in claim 59 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 60 previously included the limitation that "the selected metal is titanium, vanadium or aluminum." The mere recitation of an identified material might be interpreted as failing to further limit the claim(s) from which claim 60 depends as is required by 37 CFR 1.75(c). Furthermore, such a limitation may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 60 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim 60 has been amended in the present reissue application to recite:

> 60. *The method of claim 58, wherein* providing a reagent or a reagent mixture further includes providing [[*the selected metal is*]] *titanium, vanadium or aluminum.*

The inclusion of affirmative method acts in claim 60 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 61 previously included the limitation that "the compound of the selected metal is titanium tetrachloride, vanadium tetrachloride or aluminum trichloride." The mere recitation of an identified compound might be interpreted as failing to further limit the claim(s) from which claim 61 depends as is required by 37 CFR 1.75(c). Furthermore, such a limitation may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 61 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim 61 has been amended in the present reissue application to recite:

> *61. The method of claim 58, wherein* providing a reagent or a reagent mixture further includes providing [[*the compound of the selected metal is*]] *titanium tetrachloride, vanadium tetrachloride or aluminum trichloride.*

The inclusion of affirmative method acts in claim 61 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 62 previously included the limitation that "the reagent or reagent mixture further comprises at least one additional reagent at least one additional reagent capable of reacting at the reaction temperature to form and equilibrium mixture comprising an oxide or alloy of the selected metal." The mere recitation of a component of a reagent or reagent mixture might be interpreted as failing to further limit the claim(s) from which claim 62 depends as is required by 37 CFR 1.75(c). Furthermore, such a limitation may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 62 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim

62 has been amended in the present reissue application to recite:

> *62. The method of claim 58 [[wherein the reagent or reagent mixture further comprises]] further comprising providing at least one additional reagent capable of reacting at the reaction temperature to form an equilibrium mixture comprising an oxide or alloy of the selected metal.*

The inclusion of affirmative method acts in claim 62 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 63 previously included the limitation that "the reagent or reagent mixture comprises titanium tetrachloride." The mere recitation of a component of a reagent or reagent mixture might be interpreted as failing to further limit the claim(s) from which claim 63 depends as is required by 37 CFR 1.75(c). Furthermore, such a limitation may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 63 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim 63 has been amended in the present reissue application to recite:

> *63. The method of claim 58, wherein the method forms titanium metal, and wherein providing a [[the]] reagent or reagent mixture further comprises providing titanium tetrachloride.*

The inclusion of affirmative method acts in claim 63 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 64 previously included the limitation that "the reagent or reagent mixture comprises vanadium tetrachloride." The mere recitation of a component of a reagent or reagent mixture might be interpreted as failing to further limit the claim(s) from which claim 64 depends as is required by 37 CFR 1.75(c). Furthermore, such a limitation may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 64 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim 64 has been amended in the present reissue application to recite:

> *64. The method of claim 58, wherein the method forms vanadium metal, and wherein providing a [[the]] reagent or reagent mixture further comprises providing vanadium tetrachloride*

The inclusion of affirmative method acts in claim 64 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 65 previously included the limitation that "the reagent or reagent mixture comprises vanadium tetrachloride." The mere recitation of a component of a reagent or reagent mixture might be interpreted as failing to further limit the claim(s) from which claim 65 depends as is required by 37 CFR 1.75(c). Furthermore, such a limitation may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 65 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim 65 has been amended in the present reissue application to recite:

> *65. The method of claim 58, wherein the method forms aluminum metal, and wherein providing a [[the]] reagent or reagent mixture further comprises providing aluminum trichloride.*

The inclusion of affirmative method acts in claim 65 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 66 previously included the limitation that "the reagent or reagent mixture comprises titanium chloride and a gaseous or volatilizable compound of the second metal." The mere recitation of a component of a reagent or reagent mixture might be interpreted as failing to further limit the claim(s) from which claim 66 depends as is required by 37 CFR 1.75(c). Furthermore, such a limitation may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 66 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim 66 has been amended in the present reissue application to recite:

> *66. The method of claim 58, wherein the method forms an alloy of titanium and a second metal, and* wherein providing a [[*the*]] *reagent or reagent mixture* further *comprises* providing *titanium chloride and a gaseous or volatilizable compound of the second metal.*

The inclusion of affirmative method acts in claim 66 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 68 previously included the limitation that "the reagent or reagent further mixture comprises oxygen." The mere recitation of a component of a reagent or reagent mixture might be interpreted as failing to further limit the claim(s) from which claim 68 depends as is required by 37 CFR 1.75(c). Furthermore, such a limitation may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 68 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim 68 has been amended in the present reissue application to recite:

> *68. The method of claim 58, wherein the method forms a metal oxide of the selected metal, and* wherein providing a [[*the*]] *reagent or reagent mixture further comprises* providing *oxygen.*

The inclusion of affirmative method acts in claim 68 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 69 previously included the limitation that "the reagent or reagent further mixture comprises titanium tetrachloride and oxygen." The mere recitation of a component of a reagent or reagent mixture might be interpreted as failing to further limit the claim(s) from which claim 69 depends as is required by 37 CFR 1.75(c). Furthermore, such a limitation may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 69 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Claim 69 has been amended in the present reissue application to recite:

> *69. The method of claim 58, wherein the method forms titanium oxide, and* wherein providing a [[*the*]] *reagent or reagent mixture* further *comprises* providing *titanium tetrachloride and oxygen.*

The inclusion of affirmative method acts in claim 69 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 71 previously included the limitation that "the reactant or reactant further mixture comprises natural gas." The mere recitation of a component of a reactant or reactant mixture might be interpreted as failing to further limit the claim(s) from which claim 71 depends as is required by 37 CFR 1.75(c). Furthermore, such a limitation may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 71 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Additionally, the terms "reactant" and "reactant mixture" had not been previously used in claim 71 or its base claim. Claim 71 has been amended in the present reissue application to recite:

> *71. The method of claim 70, wherein providing a reagent or a reagent [[the reactant or reactant]] mixture further comprises providing natural gas.*

The inclusion of affirmative method acts in claim 71 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).

Claim 72 previously included the limitation that "the reactant or reactant further mixture comprises methane." The mere recitation of a component of a reactant or reactant mixture might be interpreted as failing to further limit the claim(s) from which claim 72 depends as is required by 37 CFR 1.75(c). Furthermore, such a limitation may not be seen as satisfying the requirements of 35 U.S.C. § 112 since claim 72 might be interpreted as reciting system/apparatus limitations while the statutory class of the claim is that of a method or process. Additionally, the terms "reactant" and "reactant mixture" had not been previously used in claim 72 or its base claim. Claim 72 has been amended in the present reissue application to recite:

> *72. The method of claim 70, wherein providing a reagent or a reagent [[the reactant or reactant]] mixture further comprises providing methane.*

The inclusion of affirmative method acts in claim 72 provides for proper interpretation of the claim and unambiguous compliance with 35 U.S.C. § 112 and 37 CFR 1.75(c).